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ABSTRACT

Guidance is offered for reviewing current Doctor of Philosophy (Ph.D.) programs and for establishing new ones. Typical academic and institutional contexts of Ph.D. programs in the United States and Canada and the standards and quality which lead to successful Ph.D. programs are presented. Part One addresses the nature and purpose of the doctoral program. Part Two outlines academic and institutional contexts of Ph.D. programs focusing specifically on organization and administration of doctoral programs, faculty responsibilities for graduate study, recruitment and retention of doctoral students, and the administrative and physical facilities required for doctoral programs. Guidelines for establishing new Ph.D. programs are also provided. Part Three provides detailed descriptions of the requirements that are commonly set for the Ph.D. degree by universities and their academic departments. Aspects such as admission to Ph.D. programs, requirements for residency and registration, financial aid, examinations, and requirements for the dissertation are addressed. (LPT)

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CGS TASK FORCE ON THE DOCTOR OF PHILOSOPHY DEGREE

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A POLICY
STATEMENT

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THE DOCTOR OF PHILOSOPHY DEGREE

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FOREWORD

This booklet represents a considerable revision and expansion of earlier publications of CGS on this topic. It appears at a time of renewed interest in the principles and processes of Ph.D. education, prompted by several concerns. Among them are the need to broaden participation in Ph.D. programs, particularly among minorities and women, and to assure that our graduate schools are producing a sufficient number of people prepared for careers in research and teaching.

Because Ph.D. education is so centered on the concept of independent scholarship, programs leading to this degree tend to be less rigid in structure than many other kinds of doctoral programs. There is great variation, particularly among disciplines, in approaches to training and in definition of what constitutes acceptable contributions to research. The authors of this booklet, while recognizing and appreciating this diversity, have developed a broad overview of the subject that will be useful to anyone interested in Ph.D. education.

Jules B. LaPidus
President
Council of Graduate Schools
March 1990

PREFACE

The Doctor of Philosophy (Ph.D.) degree is awarded by universities in many parts of the world as the mark of highest achievement in preparation for active scholarship and research. This booklet characterizes the typical academic and institutional contexts of Ph.D. programs in the United States and Canada. It also identifies those standards of quality and procedures which are most likely to lead to successful Ph.D. degree programs. It combines and updates two earlier publications of the Council of Graduate Schools: *The Doctor of Philosophy Degree (1977)* and *Requirements for the Ph.D. (1979)*. The first of these was itself a revision of two earlier statements, "The Doctor of Philosophy Degree" (1964) and "New Doctor of Philosophy Degree Programs" (1965).

Part II outlines several aspects of the Ph.D. program, most especially the academic context, faculty responsibilities, administrative organization, and facilities. A summary of factors to be considered in establishing a new Ph.D. program is included. Part III describes in some detail the requirements that are commonly set for the Ph.D. degree by universities and by their academic departments. The booklet is designed to meet the needs of a number of different readers. Its primary purpose is to provide guidance to university faculty and academic administrative officers in their review of current Ph.D. programs and in the establishment of new ones. For them, Part I should be especially useful. In addition, the booklet is designed to give prospective and current Ph.D. degree students a reasonably clear picture of the purposes of the Ph.D., the tasks to be completed, the level of performance to be achieved, and the expected schedule for completion of the degree. For them, Part III should be especially useful. It is hoped that the document will also acquaint interested members of the public with the concept of the Ph.D. degree and the achievements which are required to attain it.

PART I

The Nature and Purpose of the Doctoral Program

The Doctor of Philosophy degree is the highest academic degree granted by North American universities. It is a research degree and is to be distinguished from other doctorates such as the M.D., J.D., or Ed.D. degrees, which are designed for professional training or which focus on applied rather than basic research.

The Doctor of Philosophy program is designed to prepare a student to become a scholar, that is, to discover, integrate, and apply knowledge, as well as communicate and disseminate it. Such skills may lead to careers in social, governmental, business, and industrial organizations as well as in university and college teaching, research and administration. The program emphasizes the development of the student's capacity to make significant original contributions to knowledge in a context of freedom of inquiry and expression. A well-prepared doctoral student will have developed the ability to understand and evaluate critically the literature of the field and to apply appropriate principles and procedures to the recognition, evaluation, interpretation, and understanding of issues and problems at the frontiers of knowledge. The student will also have an appropriate awareness of and commitment to the ethical practices appropriate to the field. All of this is accomplished in apprenticeship to and close association with faculty members who are experienced in research and teaching.

A central purpose of scholarship is the extension of knowledge, and students in a doctoral program become scholars by choosing an area in which to specialize and a professor with whom to work. Individualized programs of study may then be developed and committee members selected cooperatively as course work is completed and research undertaken. When all courses have been taken, the research finished, the dissertation* written, and all examinations passed, the student should have acquired the knowledge and skills expected of a scholar who has made an original contribution to the field and has attained the necessary expertise to continue to do so.

*The terms "dissertation" and "thesis" may be considered interchangeable for the purpose of this document.

The degree of Doctor of Philosophy as awarded today by universities in the United States and Canada is based on traditions that go back to the founding of the universities of Western Europe such as those in Padua, Bologna, Paris, Oxford and Cambridge, and the flowering of philosophical work there. Programs leading to the Doctor of Philosophy have been modified as new knowledge and new technologies have arisen, and as new social needs have been identified. They now encompass many disciplines in humanities, social sciences, physical, biological, and earth sciences, education, engineering, business, law, medicine, biomedical sciences, and theology, among others.

PART II

The Academic and Institutional Contexts of the Doctoral Program

General Organization and Administration

In most institutions graduate doctoral programs rest on a broad base of undergraduate programs, and most of the faculty in a given discipline are involved in both. The undergraduate curriculum is usually prescribed by the faculties of departments and of groups of departments (e.g., a College, School or Faculty of Arts, Sciences, Education, etc.) and for each there are required courses. Those of the larger unit are for all students in that unit; those of the department for the majors in the field. By contrast, graduate, particularly doctoral, programs are more generally tailored to the discipline and to the individual student studying within that discipline.

Typically, the administration of Ph.D. degree programs is carried out at three distinctly different administrative levels: the graduate division or school, the department or program, and the faculty or dissertation adviser. The graduate division, with the concurrence of the faculty, establishes the broad requirements for the degree and the administrative format for the development of each individual program. These requirements may be administered at different levels, but they typically include: satisfactory completion of course and seminar work; satisfactory performance on certain examinations such as comprehensive examinations, foreign language and/or research tool competency examinations; a period of residence at the institution; the completion of a dissertation; and a time limit for the completion of all degree requirements (see Part III for details). The graduate division may or may not set course requirements for the degree, but it usually establishes the form for program and dissertation advising, and for the final university oral. A committee structure is often specified which requires a program and/or dissertation advisory committee for each student—these may be the same or different committees.

Although there are several different kinds of administrative structure for graduate education (see the CGS publication on *Organization and Administration of Graduate Education*), two models predominate, and most others are variations on these two. In one, the

graduate division is responsible for all graduate degrees offered by the institution. In this model, all graduate committees and graduate students are responsible to the graduate dean, and final determination that degree requirements have been met is the responsibility of the dean. In the second model, there is a graduate school of Arts and Sciences, and the sphere of the graduate dean's authority may be limited to departments and colleges in that area alone. Professional schools, in this structure, are responsible for their own graduate programs.

Individual programs for doctoral students in their pre- dissertation years are developed cooperatively with a department adviser who is a member of the graduate faculty. A committee of graduate faculty members works with the adviser in directing the student until degree requirements have been completed. This committee is chosen by the department or by the student, depending on the institution, for their special expertise in the areas of the student's research. Specific methods for choosing a dissertation adviser and dissertation topic vary markedly from discipline to discipline and from institution to institution. In some cases committee members for graduate students are recommended by department heads to the graduate dean who officially appoints them. In some institutions individuals with special competence who are not members of the university faculty may serve on dissertation committees, always under the control of a faculty committee and the graduate dean. Under some circumstances (such as a change in the research project) there may be changes in adviser and/or committee members; such changes are always regarded as serious, especially after official appointment, and are made with due regard for the integrity both of the student's program and of the department.

The graduate dean, working with faculty, is responsible for the quality of the graduate programs. Together they conduct reviews of the graduate programs, determine to what degree each program is viable, and advise the administration on where investments in particular areas of knowledge and lines of research and teaching should be made. The faculty may delegate this responsibility to a committee or council, either elected or appointed, that meets regularly with the graduate dean to advise and assist in a variety of ways with the management and operation of the graduate division. The graduate committee or council may be concerned with policies and procedures covering such subjects as: graduate faculty membership; quality of the curriculum; requirements for graduate degrees; admission of students; fellowships and awards; funding of graduate research and teaching assistantships; rights and responsibilities of graduate student research and teaching

assistants; graduate student committee membership; or any other subject or problem of concern to them and the graduate dean.

Graduate schools with strong programs have several faculty members in each field in which doctoral programs are offered, thus giving the students the benefit of several points of view and providing sufficient faculty for their supervision, evaluation, and examination. At least four or five professors participate in the doctoral program for the larger and more subdivided fields. The academic interests of the professors generally supplement each other. For instance, in French language and literature programs, the periods of French literature might be represented, and also narrative theory, culture studies, or linguistics; or, in physics, fields represented might be atomic physics, nuclear physics, solid state physics, and low temperature physics.

Graduate departments should set forth explicit guidelines and procedures for completing degree requirements so that the students and faculty know and understand their opportunities, duties, and responsibilities. These guidelines include: objectives of the doctoral program; departmental requirements beyond those of the graduate division; reading lists for comprehensive examinations, if relevant; testing dates; course and seminar offerings; research specialties offered; and the faculty responsible for each. In addition, departments, in cooperation with the graduate division, provide information on sources of funding, both within and from outside the university.

Doctoral programs complement each other at academically strong universities, thus providing stimulation and intellectual strength to the entire academic enterprise. For example, a doctoral program in French language and literature can be significantly strengthened by the presence of strong doctoral programs in other languages, English, history, and philosophy. Similarly, a doctoral program in physics can gain strength from active doctoral programs in mathematics, chemistry, and radiation biology. Furthermore, some of the most interesting and challenging questions arise at the boundaries of existing disciplines and may not be amenable to resolution by existing disciplines or departments. Such interdisciplinary research questions may be addressed more appropriately by cooperative efforts, as for example in the bio-medical area, or in areas of comparative literature and literary theory. Some universities therefore permit the development of interdisciplinary programs outside of traditional departmental structures, but always subject to approval and review by the graduate dean.

Doctoral programs frequently include work in one or more related or "minor" fields, in order to provide breadth as well as depth of training. To assure that this is achieved, the student's advisory committee may include a professor from each of the minor fields as well as the student's major professor and one or more other professors from the major department.

Faculty Responsibilities for Graduate Study

The quality of the graduate faculty is the single most important factor in the establishment and maintenance of an excellent program leading to the Ph.D. degree. Each member of the graduate faculty must be a creative scholar, that is, an accomplished researcher and an excellent teacher and mentor; graduate teaching is an extension of his or her research. Usually each member of the graduate faculty has earned a doctoral degree relevant to the field, remains personally active and engaged in teaching and research, and publishes the results of research regularly through professionally recognized channels. Each faculty member works with students in the doctoral program as classroom teacher, major professor, and/or as a member of dissertation committees. A significant part of the individual graduate faculty member's responsibilities to the institution is that associated with the effort required to direct doctoral students through the four to five years of full time study necessary to complete the degree. The number of doctoral students a professor can successfully direct at any one time depends upon the field of study, the individual faculty member's other responsibilities, and the quality of the students accepted into the program.

Faculty are also departmental members, and the most important ingredient for departmental success with doctoral students is a strong departmental commitment to graduate study and to the responsibility for graduate students which this entails. Although the training of doctoral students may compete for attention and resources with other departmental responsibilities, no doctoral program will prosper unless the departmental environment is supportive of its aims and needs.

Faculty are responsible for promoting the central values of scholarship (truth, honesty, freedom of inquiry, intellectual autonomy) in themselves and in their students. Ideally this involves explicit attention to the ethics of the field, to the responsible conduct of research, to publication of the research, to excellence in teaching, and to the development of a community of scholars.

Recruitment and Retention of Doctoral Students

Among the major responsibilities of the faculty are selection of students for admission and retention of admittees through careful advising and mentoring. Potential students are made aware of doctoral programs through their advisers in undergraduate programs, through networks in industry, and through various publications such as *The GRE/CGS Directory of Graduate Programs*, *Peterson's Guide to Graduate Programs*, or posters and other information prepared by graduate departments. These posters typically give a profile of the program and of research conducted in it, as well as of requirements for the degree.

Among the major responsibilities of the university administration, the school deans, and the faculty is devoting time and attention to the recruitment to doctoral programs of women and members of underrepresented ethnic groups. Doctoral programs should seek fair representation of demographic groups and enrichment by their presence. Recruitment is not enough. Graduation should also be a major responsibility. High-quality curriculum, teacher training, challenging research projects, and financial aid are necessary to train and graduate a more diverse group of teachers, professors, and national leaders than has been typical in the past. For detailed discussion, see the CGS publication, *Enhancing the Minority Presence in Graduate Education*, 1988.

Advising and Mentoring

Methods for exercising the responsibility for advising and mentoring vary from one institution to another. Those that provide continuous feedback, both formal and informal, are the most successful.

Initial orientation and advice about course work and examinations may be provided by the person responsible for coordination and monitoring of graduate study in the department until the student chooses an area of research. Sometimes a committee of graduate faculty members is appointed for each doctoral student to provide this guidance. The adviser and/or committee meet with the student and assist in planning a program of course work, seminars, and research, monitor the progress made toward completion of the program of study, arrange for the administration of examinations and make recommendations about the student's continuation in the program. The adviser and/or committee also determine when the student is ready to be recommended for the degree.

The supervisory committee that directs the dissertation may, but often does not, consist of the same members as the original advising committee. The principal adviser of a dissertation in

particular is a mentor in a special position of influence and trust. Inasmuch as dissertation advisers have the most to say about whether the student has done adequate research, and make employment recommendations for positions after the degree has been completed, they have a most serious responsibility to foster in the student intellectual autonomy, appreciation of the highest academic standards, and a realistic sense of appropriate career options for the particular case.

At all stages, advising is a reciprocal responsibility. Faculty are expected to be diligent in providing counsel and guidance, and to be available for consultation. They should demonstrate flexibility and critical thinking; a willingness to be challenged and to challenge constructively; and the desire to help the student become better at research and teaching than they are themselves. Students, for their part, are expected to seek out actively the guidance of their advisers. The reciprocal nature of advising can be highlighted by an exit interview with the department chair or dean in which the student's experience in the program can be fully discussed.

Ideally continued support and mentorship are provided throughout a student's later career, most especially through tenure in the case of academic careers.

Seminars, Colloquia, and Research Centers

Good advising alone is insufficient for a good graduate program. Other aspects of retention include the building of an esprit de corps among graduate students and professors. The aim is to provide the extra stimulation and passion for learning that lead to socialization into the academic climate of the discipline and to the development of "a community of scholars."

The sense of common purpose can be encouraged by joint research projects, or by seminars in which the students present reports on the literature or on their own research, and where faculty are free to interact with other faculty and graduate students. Such projects and seminars may play a far more significant part in the training of graduate students than regular classes. In particular, they provide good job preparation for budding scholars and teachers, and can lead to important improvements in the student's research. Doctoral programs usually also make provisions for colloquia or seminar series in which students can hear distinguished visitors from other institutions, and discuss their own work with these visitors.

Many universities have research centers that extend the university's research in areas of inquiry that require mutual effort by faculty from various disciplines and departments. They offer faculty and students opportunities to do research in multidisciplinary configurations not easily achieved within the boundaries of traditional departments and programs. For example, a research center on organization theory may bring together faculty and graduate students from business, economics, political science, education, psychology, industrial engineering, medical information sciences, as well as university administrators in one or more projects that reach out beyond departments and even schools. While research centers may or may not offer degrees, they greatly enhance doctoral work.

Administrative Services and Physical Facilities Required for Graduate Programs

For the faculty to fulfill their responsibilities effectively, there must be an institutional commitment to high quality graduate work as indicated by the degree to which support is provided for research and instructional programs. Competitive salaries for faculty, suitable offices, secretarial and technical services, graduate scholarships and assistantships, teaching and library resources, personal computers, computer time, and adequate funds for supplies used in teaching and research are some examples of the support that must be provided by institutions seriously committed to graduate education.

Institutions offering graduate work leading to the Ph.D. degree typically are organized into schools, colleges, faculties, or divisions, and departments, comprising faculty with a wide variety of scholarly and research interests. Although governing boards are legally responsible for the activities of the institution, they delegate operational responsibility to the chief administrative officer. In turn, the faculty are given responsibility for the nature and functioning of the academic programs, and are administratively responsible to department heads, deans, and the academic officers of the central administration. The strength of the institution in graduate education will depend to a large extent on the vigorous and enthusiastic support given by this group of administrators.

Successful graduate instruction and research require a variety of facilities and resources to support and encourage the academic enterprise. Among them are the following:

Teaching Facilities

Graduate programs are greatly enhanced by centralized teaching services that complement the training of teaching assistants provided by departments. Such facilities provide generic information on classroom or laboratory instruction, and services such as videotaping, classroom visits, personalized practice sessions, and other resources, including detailed feedback designed to improve teaching. In conjunction with faculty and student committees they may design teaching assistant evaluation forms for use in classes or sections taught by teaching assistants.

Libraries

An adequate library and effective library services are indispensable resources for graduate programs. Institutions offering doctoral programs ensure that resources are available to the libraries to maintain adequate collections including computerized databases for those fields in which doctoral programs are offered. In addition to their collections, good libraries provide convenient study surroundings, such as carrels, easy access to the stacks, on-line access to catalogs, access to external databases, interlibrary loan exchange programs and facsimile transmission, photocopying provisions (within copyright guidelines), simple check-out and return arrangements, and provisions for long term check-out for the faculty and for dissertation students. Contemporary libraries are not only repositories of knowledge, but active participants in developing audiovisual and other non-book materials. Research librarians and bibliographers play a major role in assisting research and in instructing faculty and students about the changing nature of information systems.

In many large doctoral institutions there are also departmental and branch libraries that specialize in a particular field.

Computer Facilities

Computers and the services available through a computer center are also an indispensable resource for many graduate programs. Computer technology is evolving rapidly, and the major concern of the institution should be to ensure that the faculty and students have access to the computing capability necessary for research. Computers have become an integral part of most research; they are central to experiments in the physical and life sciences; to quantitative work in the social sciences; to research on logic in cognitive and information sciences; and they provide data banks essential to work in the humanities. Any university policy for computers must recognize their great utility and flexibility, and the changing uses to which they are being put in different fields.

Physical Facilities

A university with strong doctoral programs will have good classroom and seminar facilities, and, in appropriate fields, well-equipped teaching and research laboratories. It will also provide each doctoral student with adequate working facilities, such as desk space and library carrels, computer access, laboratory facilities, or field accommodations. Graduate student lounges or "centers" are especially useful in providing opportunities for learning through informal meetings with other graduate students and with faculty.

Some departments have reciprocal arrangements with other universities, industries or government laboratories, whereby specialized equipment is shared so that professors and graduate students may conduct experiments that would otherwise not be feasible. Inter-institutional arrangements for graduate students to take on other campuses courses not available on the home campus provide additional ways in which doctoral programs are made more effective.

Auxiliary Facilities

Graduate students and faculty frequently need access to highly specialized services and skills. Research equipment such as nuclear reactors, sophisticated spectroscopic facilities, and electron microscopes are essential in certain disciplines to enable the faculty and graduate students to address significant problems and make important contributions to knowledge. In some cases, such facilities may be available on campus. In others, access to government scientific facilities such as nuclear reactors and accelerators will suffice, or indeed be preferable, provided adequate funding for graduate student as well as faculty participation is available.

Some disciplines require a variety of shops with specialists who are able to fabricate new devices, modify and adapt existing equipment, and make necessary repairs. Instrument maintenance and repair technicians, skilled photographers, scientific illustrators, and other auxiliary resource personnel contribute significantly to the success of many research programs. An interested and competent non-teaching staff, such as maintenance personnel, programmers, supporting services and agencies, and particularly the clerical staff, is essential for the effective and successful conduct of graduate programs. Institutions committed to doctoral study provide these and other auxiliary facilities and services, as needed by researchers in the various disciplines in which the institution offers doctoral degree programs and in complementary disciplines.

All of the above facilities, services, and personnel must not only be available, but must also be skillfully coordinated and intelligently administered if they are to assist effectively in the development of new knowledge.

Guidelines for Establishing New Ph.D. Degree Programs

The following is a brief outline of conditions and processes that need to be considered when a new Ph.D. program is being established. These will of course vary considerably from institution to institution.

The decision to initiate a doctoral program is based on many factors and conditions. Those considered to be most important are:

1. There is clear evidence of the potential for a high-quality program that could not reasonably be subsumed under a program already in existence in the university.
2. The faculty who will participate are already productive in research and are in full support of the new program.
3. There is clear evidence of student interest.
4. Adequate financial resources and opportunities are available to attract high-quality graduate students.
5. The administration fully understands its responsibilities and is supportive of the program.
6. Library facilities are adequate for doctoral study in the new program area as well as in supporting areas.
7. Laboratories or comparable facilities are available and adequate for the new program.
8. Appropriate officers and procedures for administering and reviewing the program are already in place.

When the above conditions prevail, the following process will increase the likelihood that the institution can establish a sound program leading to the Doctor of Philosophy degree:

1. Form a faculty committee that will develop the proposal for the new doctoral program, which will include the following:
   a) The reasons for offering the new program.
   b) The need for the program in light of the university's programs, and of local, regional, and national need.
   c) The expected contribution of the program to existing university departments, and the liaison mechanism to be established with those departments.

d) The number of students expected to participate in the program.
e) The form and availability of student funding.
f) The plan in place for affirmative action or student diversification.

2. Develop a detailed plan for the new program, including goals and objectives, academic procedures, estimated costs to the institution, and a statement of standards to be followed based on those of the Council of Graduate Schools, the regional or provincial accrediting associations (where appropriate), the appropriate professional organizations, and practices at other universities granting the Doctor of Philosophy degree.
3. Develop a tentative schedule for establishing the new program and reviewing it; this schedule should allow sufficient time (usually one year after approval of the program) for adequate recruitment of a quality applicant pool.
4. Present the proposal to faculty and heads of cognate departments for their suggestions and approval.
5. Present the proposal to the graduate dean for initial approval.
6. Invite outside consultants to review the proposal, make recommendations, and visit the campus to determine whether the department and the university are ready for the new program. If appropriate, consult with the public coordinating or regulating agency to which the proposal must ultimately be submitted.
7. Submit a revised "final" version for submission to the graduate dean and other appropriate authorities, such as the graduate committee or the curriculum committee.
8. Submit the proposal to relevant bodies, such as the faculty governance committee, the administration and the governing board, the state or provincial agencies (where appropriate), and the regional or provincial accrediting association (where appropriate).

PART III

Requirements and Specific Aspects of the Doctoral Program

General Nature of the Program

A doctoral program is an apprenticeship that consists of lecture or laboratory courses, seminars, examinations, discussions, independent study, research, and, in many instances, teaching, designed to help the students make significant contributions to knowledge in a reasonable period of time. The first year or two of study is normally a probationary period, during which most of the effort of doctoral students will be devoted to acquiring a working knowledge of the field through study of the literature, taking formal courses and seminars, learning research and experimental techniques, problem-solving, and beginning to teach and do research. After being admitted to candidacy students devote essentially full time to completing the dissertation research planned with the major adviser, and the dissertation committee. Preparation of the dissertation usually occupies one to three years, depending on the field. An oral defense of the research and dissertation by the candidate before a graduate committee and sometimes other persons invited to attend constitutes the final examination. All requirements for the degree should be available to the student in written form.

Programs are usually arranged so that well-prepared and self-motivated students can complete all requirements in four to five years of full-time study and research beyond the baccalaureate degree in the sciences, somewhat longer in other areas. In recent years the total time required to complete the degree has tended to expand. The reasons for this tendency need to be studied carefully and controlled where this is feasible; they may include laissez-faire advising, inadequate funding, uncontrolled expectations regarding the amount of teaching to be done; inappropriate expectations regarding the extent of the dissertation; and external factors such as changes in the job market. In any event, it often takes longer for students with heavy teaching loads or those working on dissertations that require extensive field work, to complete degree requirements. Some students have to leave campus entirely and take full-time employment before finishing the dissertation; this inevi-

tably delays completion of the Ph.D., and sometimes disrupts the expected career plan. While it is the responsibility of the faculty to provide guidance to students regarding their academic career, it is equally the responsibility of the graduate student to consult with the adviser and provide information about work done, problems which have arisen, and plans for study.

Admission

Since the Ph.D. degree is awarded as the mark of highest achievement in preparation for active scholarship and research, aspirants for the degree are expected to have demonstrated a high level of ability in their prior programs and potential for completing with distinction the requirements for the degree. In some programs, doctoral students may be admitted directly from baccalaureate programs. In others they may be admitted only from master's programs. In some cases, for example some programs in education, a considerable period of post-master's professional work experience is expected.

Admission to the Ph.D. degree program is based on a variety of criteria established by the graduate division and by the graduate faculty of the department or organizational unit of the university in which the program resides. This admission process seeks to assure quality among programs at a given institution as well as quality within particular programs. Almost always the graduate division requirements set forth minimal standards to be met by all persons admitted to graduate study. The standards set by the department are specific for that department, and may be higher or more demanding than those of the graduate division. Normally, the graduate division requires that an applicant hold a baccalaureate degree from an accredited institution where the basic requirements are equivalent to those of the admitting institution, including adequate preparation in the chosen field(s) of study. In some cases, institutions will accept students whose academic credentials are considered equivalent to the baccalaureate. The department into which the applicant is seeking admission will specify the minimal acceptable undergraduate preparation, including grade point averages, in the areas appropriate to the chosen field or fields of study, and, in many cases, the specific course content that must have been completed. (It should be noted, however, that completion of a "major" in the field(s) to be pursued at the doctoral level is not always necessary). Occasionally, circumstances may justify admission on the condition that certain undergraduate courses be taken to make up deficiencies.

Initial admission to the graduate division may be for a program leading to a master's degree. (For information about this degree refer to the publication of the Council of Graduate Schools entitled *The Master's Degree*). Criteria for admission to doctoral programs used by departmental faculty committees and the graduate dean typically include: undergraduate and graduate grades, scores on tests, a statement of purpose by the student, a sample of the student's work, recommendations and personal statements by current or former professors, interviews, work records and references, and sometimes completion of the master's degree or its equivalent.

In order to help determine the admissibility of the applicant, most graduate schools require satisfactory performance on one or more standardized tests. These help admissions officers to compare the individual applicant with the norm as well as with current and past applicants to the program. One widely used test is the Graduate Record Examination (GRE). The GRE Board's own caution should be widely recognized: GRE scores should never be taken as the sole criterion for admission, but rather should be used in conjunction with other measures, such as those mentioned above. As an aid in determining adequate competence, universities often require satisfactory scores on standardized verbal or quantitative tests, or on those developed within the institution. In general, students whose native language is not English or who have not attended an undergraduate institution where English was the medium of instruction must in addition demonstrate mastery of English by submitting a satisfactory score on the Test of English as a Foreign Language (TOEFL), offered worldwide by the Educational Testing Service, or by other equivalent methods.

In seeking ways to diversify the student body, it has long been recognized that some students who do not score well on standardized tests or perform well in traditional programs may have the potential and talent for advanced study. Graduate division staff and faculty need to find ways to identify such students. While difficult to measure directly, clues to motivation and dedication to learning are often found in evidence of specific skills relevant to the program, whether or not they were developed as part of the baccalaureate training, or tested by standardized means. Only those considered capable of completing the doctoral degree should be admitted.

Full-time Study and Residence

Most universities require at least one or two years of continuous residence. This allows students to concentrate exclusively on course work or research, to acquire those habits, attitudes, skills, and insights necessary for attaining the Ph.D., and to find opportunities to work closely with the professors and other students.

The on-campus residence provision provides other advantages as well. For example, fluency in the language and vocabulary of the specialization is enhanced by frequent and close association with other students in the same field; competence in the field is enhanced by close familiarity with the university's libraries; valuable experience is gained by attending and participating in both formal and informal seminars, colloquia, discussions led by specialists visiting from other campuses, laboratories, or governmental research organizations; and thesis or dissertation research is facilitated by frequent consultation with the adviser.

Students employed on campus during their study toward the doctorate as teaching assistants, research assistants, or in other capacities, can meet the stated residence requirement in ways that fulfill the objectives of the requirement. Students employed full time off-campus encounter difficulty not only in meeting the residency requirement but also in gaining the benefits that this requirement is intended to provide. (For a discussion of nonresident degree programs, see the publication of the Council of Graduate Schools entitled *Off-Campus Graduate Degree Programs*.)

Registration

Requirements for residency and for registration are not necessarily the same.

Graduate students are usually required to register for courses and/or research each quarter or semester in which they are working toward their doctorates. This is necessary in order to document the full commitment of the university, in terms of staff and resources, to the student.

Some institutions require full-time and continuous registration from the time a student is admitted until the degree requirements are completed, whether the student is on campus or not. In this case students must register and pay tuition and fees at the same rate for all credits earned, during the course of acquiring the degree. Other institutions may require registration for a minimum number of years of full-time study (usually a year for the master's

degree or its equivalent and two years for the doctorate). Once that requirement has been met, reduced registration fees are generally permitted thereafter.

Financial Aid

Students who have the required academic qualifications frequently lack the financial resources needed for doctoral study, so in order to assure that highly qualified students are able to attend graduate school, most institutions provide financial assistance in the form of loans, scholarships, fellowships, and assistantships. Scholarships and fellowships are usually grants which require no service of the recipients. Assistantships usually require the students to perform some service for the university, such as aiding faculty in teaching classes or conducting research. In return for the service, which may or may not be a stated degree requirement, the assistants are provided stipends and apprentice-like teaching and research experience.

Because teaching and research assistants provide a time- consuming service in addition to being trained for the Ph.D., they normally register for fewer classes than students not on assistantships; this means that the time needed for students on assistantships to complete degree requirements may be extended. However, unless the extension of time is exceptionally protracted, the benefits of the assistantships especially for development of research topics and for later career development far outweigh the disadvantages in terms of time.

Examinations

Placement Examinations

Some institutions and departments administer an inventory or placement examination when students are first admitted to the master's and/or doctoral programs to determine the extent to which previous educational experiences have prepared them for advanced study. Since courses bearing the same title may vary in content from institution to institution, the placement examinations are designed to ensure that the student is adequately prepared to undertake advanced work.

Qualifying Examinations

In some cases, often dependent on field, an examination (its labels vary, e.g. "preliminary," "qualifying") may be required after the first year of graduate study or after half the course work has been completed; its purpose is to ensure that the student is making satisfactory progress.

Although not all universities require preliminary examinations, virtually all universities require an examination for admission to candidacy after the student has completed appropriate courses and seminars. This examination also has different labels depending, for the most part, on the tradition of the institution (it is often called a "general," "comprehensive," or "qualifying" examination). Regardless of its title, its purpose is to determine the student's readiness to undertake independent research. As in most things in graduate education, there is a great deal of departmental autonomy in the design of this examination, but in many universities the graduate division is responsible for establishing the general conditions for the examination, including the fact that such an examination shall take place. This examination often consists of both a written and an oral part and is usually prepared, administered, and evaluated by a committee of faculty members appointed by the graduate division. Because of the importance of these examinations most schools allow students a second attempt if they do not perform satisfactorily on the first. Usually, the examination may be repeated only after a waiting period (a quarter, a semester, or a year), which allows the student time to take appropriate courses and otherwise prepare more adequately for the second examination. Students who fail this examination are not advanced to continue working toward a Ph.D.

The requirement of a final university oral examination, usually based on the dissertation research, is discussed below.

Candidacy for the Doctorate

A strong doctoral program is designed to ensure a relatively early decision on the doctoral aspirant's ability to complete the degree. In many institutions students are essentially on probation for the first two years of graduate study. They are "admitted to candidacy" for the doctoral degree by the end of the second year or the beginning of the third after a number of qualifying procedures have been satisfactorily completed. Admission to candidacy means that, in the judgment of the faculty, the doctoral student has an adequate knowledge of the field and the specialty, knows how to use the academic resources, has potential to do original research

autonomously, and presumably will complete the dissertation. The qualifying procedures may include one or more of the following: formal course work; proficiency examinations in language and/or other research tools; comprehensive (or general) written and oral examinations; one or more research papers showing evidence of the ability to do original work (examples include papers presentable at a professional conference, "mini grant proposals"), and an accepted doctoral dissertation proposal. Research, advanced seminars, optional courses, and in some fields, further examinations, occupy the student's attention from this point until the dissertation has been written and the final oral examination has been passed.

Teaching

The primary purpose of a graduate teaching assistantship should be to prepare the student for a future career, whether academic or not. Experience in teaching adds to a student's program active experience in lecturing, leading discussion, and evaluating other students. As an act of learning, refining, and transmitting the knowledge acquired through research, teaching is a direct part and indeed outcome of scholarly research. Financial aid to the graduate student and support of the undergraduate teaching program should be secondary objectives in good Ph.D. programs.

Programs of training, such as pedagogy courses, and evaluation are essential in the development of teaching assistants and in the effort to provide high-quality undergraduate teaching. Such training programs may be conducted by faculty in departments, or by central teaching facilities devoted to teacher training, or some combination of the two. Ideally, a faculty member works directly with the teaching assistant in developing the course and in evaluating the teaching. Training programs are therefore effective in reinforcing the role of faculty as mentors in the doctoral student's professional training. At the same time, teaching assistants can be important resources for course material, expertise, and feedback to faculty preparing syllabi; also they can serve an important role in training less experienced teaching assistants. Awards to teaching assistants for excellence in teaching can serve to emphasize the value to the academic community of good pedagogy.

Research

Depending on field, some students may begin work on research under the direction of an adviser or major professor soon after

admission. Others may rotate through several laboratories in order to become familiar with different research possibilities. Still others may not begin work on research until after admission to candidacy. The first research experience may be designed by the adviser as a good introduction to research; it may or may not be used ultimately for the dissertation. Pre-dissertation and dissertation research are both guided by the same principles concerning ethical issues and classified or proprietary research.

In some fields, doctoral students may serve as research assistants on sponsored research grants or contracts under the guidance of a faculty member. The degree to which the research done by the students is independently conceived and conducted may vary greatly, depending on the nature of both the field of research and the sponsorship. In all cases, however, students will be expected to make original contributions if the research is to form part of the doctoral dissertation.

The Dissertation

There is no assurance that, having completed the course work, seminars, examinations, teaching and research requirements, the student will be awarded the degree, since the quality of the dissertation and the significance of the contribution to knowledge are important considerations that must be weighed by the committee in making the final recommendation for award of the Ph.D.

The process of writing the Ph.D. dissertation includes development of a hypothesis, analysis and interpretation of research results and conclusions drawn therefrom. It fulfills two major purposes: (1) it is an intensive, highly professional training experience, the successful completion of which demonstrates the candidate's ability to address a major intellectual problem and arrive at a successful conclusion independently and at a high level of professional competence, and (2) its results constitute an original contribution to knowledge in the field. Doctoral research should be a mutually energizing experience between student and adviser; the student should therefore participate actively in identifying a good research topic.

Graduate schools require that the research activities connected with a dissertation be approved in advance and performed under the direct and continuing supervision of an appropriate member of the university faculty. Prior work, not so approved and supervised, is not acceptable for a doctoral dissertation.

Once an area of research in which the dissertation is to be written is approved, a dissertation committee is appointed, usually by the graduate dean, which may or may not include the same committee members who formerly advised the student. Three to five professors—from the department, from other departments, and occasionally from another university—are usually asked to serve. The major professor directing the student's research serves as chair of this committee. Such a committee provides a means of exposing the candidate's ideas to a variety of views early in the planning. This may help avoid the development of an ill-advised research project and embarrassment, or worse, at the time of the final oral examination.

Selection of Topic

Final choice of the dissertation topic involves the student, the adviser, the committee members, and sometimes other university committees. The method of identifying a dissertation project or topic varies markedly both among and within disciplines but its final selection is by agreement between the candidate and the research adviser or advisory committee. Frequently, the candidate submits a formal research proposal for the advice and suggestions of the adviser(s), and for permission to proceed. When this procedure is followed it establishes a kind of contract—an agreement not only on the research topic, but also on its scope.

The allowable scope of the dissertation project is difficult to state precisely. The dissertation should clearly be a substantial and significant undertaking, yet not so extensive or open-ended that it cannot be successfully concluded in a reasonable period of time. The trend in recent years has been away from the long and comprehensive dissertation project, and in the direction of a more sharply delineated task requiring perhaps a year to two years of full-time productive effort. The dissertation should be the introduction to a career of research and scholarship, not its apex.

Probing the unknown often leads to unforeseen outcomes. The risks vary greatly from one research topic to another. Universities and even departments may differ on whether negative results are acceptable, assuming the quality of the work is high. A careful assessment should be made of the risks of obtaining negative results and if they appear significant, the consequences must be clearly understood by the candidate and the adviser in the context of larger institutional expectations.

Some institutions require that the dissertation topic be approved by the candidate's department as well as by the advisory commit-

tee, and some require that the tentative (working) title of the dissertation be filed in advance in the graduate dean's office. If the research will involve human subjects, it will be necessary to obtain prior approval from the appropriate university committee on research involving human subjects, with respect to topic and procedures. Similarly, if the research involves animal subjects or has implications for such matters as safety and environmental impact, or other areas under governmental regulation, it must be reviewed and approved by the appropriate university committee or board. Both the adviser and the student should be sure such approval has been received before the research is begun.

Off-Campus Research

There may be some situations in which off-campus dissertation research is justified. However, the department and/or the graduate dean must give prior approval for it. A typical example is extensive field work such as is required for the Ph.D. in anthropology. Another is the opportunity for a student in engineering to carry out dissertation research in an industrial or governmental setting which provides resources (such as major research facilities) which the university department cannot furnish. Supervision by the adviser can be difficult in such circumstances, and it is mandatory that the university develop adequate procedures to guarantee proper oversight and supervision of the research. The university may require that such a student return to the campus to complete the writing of the dissertation, so that the library, the computer center, and the research adviser(s) are available. In any event, the key considerations are whether prior approval for topic and methods has been given, and whether adequate supervision can be given by the appropriate university research adviser(s).

Sponsored, Classified or Proprietary Research

Graduate students involved in sponsored research should be informed of relevant research policies governing issues such as patents, copyright, disposition of tangible research property, and guidelines on secrecy in research. They should also be informed of the identity of the sponsor.

Research that is "classified" by a government agency, or that is proprietary in nature and restricted with regard to publication, is widely held by universities not to be suitable for doctoral research. An essential aspect of dissertation research and scholarship is the free and full dissemination of research results. Restrictions, either in the conduct of dissertation research or in the sharing of its results, are antithetical to that spirit. However, there may be an

agreement that publication of a dissertation can be delayed for a specified period of time, e.g. 90 days, so that the student, or the sponsor who provided the funds and perhaps even the laboratory space or equipment for the research, can seek a patent.

Ethical Issues

Graduate students must be sure they understand the ethical issues involved in research, and the consequences to themselves, their institutions, and to scholarship itself of any erosion of integrity.

In all types of research, including dissertation research, the highest standards of conduct are expected. Despite the enormous variety of fields and disciplines, certain general standards apply to all. The most important ones concern plagiarism, the faking or falsification of experimental data, improper use of human and animal subjects, and disregard of health and safety standards. Another area of concern is conflict of interest: research should be conducted independently of the particular and immediate interest of industrial and private companies that may fund the research or research space, even when research results are not subject to publication delays as outlined above.

In any kind of research one confronts the question of originality. The synergy of team work, and pressure on both faculty and students to publish results or to prepare conference papers, often create significant ambiguities concerning academic authorship and "originality." Open discussion of authorship issues and of the importance of full acknowledgments and other forms of attribution should be part of graduate training.

Joint Authorship

In all cases of joint authorship, individuals working together should establish ahead of time the criteria for their co-authorship. There are certain customs (which vary according to field) with regard to the order in which authors' names are listed, or whether running an experiment as opposed to designing it, entitles a researcher's name to appear among the co-authors. All co-authors in a collaborative project share responsibility for its integrity, and should have the opportunity to review all data prior to publication of the results.

Since the doctoral dissertation is, at least in part, a demonstration that the candidate has now reached a level of mastery of the field adequate for a career of scholarship and research, the research being reported should be the candidate's own work. Many universities explicitly state that the doctoral dissertation must be the

work of a single author, i.e., joint or co-authored dissertations are not acceptable. However, recognizing the frequency of collaborative and team efforts in present day research, some institutions specify conditions under which collaborative research may be acceptable for doctoral dissertations. In such cases it is usually required that the major part of the presented dissertation be the candidate's own work, and that it be stated clearly (in the preface or elsewhere) exactly what the candidate's contributions were. In those instances in which jointly-authored journal articles or manuscripts are submitted as part (or all) of the dissertation, the candidate's own contributions should be a substantial part and it should be clearly indicated what they are.

Format

Over the course of the years universities have found that it is important that the dissertation have a well-defined format. In order for the dissertation to be useful to the scholarly community as a whole, the final document must meet a number of criteria. Universities typically set forth, either in the graduate school catalog or in a special publication, the specific requirements for preparing the dissertation document, including typing or copying requirements, methods of citation, and related matters. Requirements for format may be dictated in part by such external criteria as availability of the dissertation for microfilming.

Some institutions permit the offering of one or more published articles, the research for which has met the requirements of the department and the graduate division, as part or all of a dissertation. Alternatively, with the approval of the department and the graduate dean, the candidate may be permitted to submit the dissertation in the form of a manuscript (or manuscripts) to be submitted for publication in a scholarly journal. In those instances in which the submission of published articles or of manuscripts is permitted, it is often required that the candidate include introductory, transitional, and concluding sections, in order to achieve a more coherent and rounded piece of work. Also, the candidate may be required to include appendices which will provide more detailed materials on history, methods, and results than would ordinarily be presented in published journal articles.

All institutions expect, and some explicitly state, that the dissertation should be written in literate and lucid form, thus demonstrating the candidate's ability to communicate clearly and effectively. Most institutions require the dissertation to be in English. Others

may allow or require the dissertation to be in another language, sometimes depending on the field.

The Final Oral Examination

In most universities a final oral examination is required. The nature and scope of this examination, the composition of the examining committee, and the rules of procedure may vary, subject to policies set by the graduate dean, but the examination typically concentrates on a defense of the dissertation and its relation to the specialized field in which it lies.

The nature of the "defense" varies according to field. In some, the defense may essentially test the student's skills in intellectual analysis and debate; it may therefore consist primarily of the presentation of the student's ideas on or interpretations of some topic, which are defended against criticisms concerning their reasonableness, superiority over earlier interpretations, etc. In other fields, however, the student may have to defend experimental design, data collection procedures, and the interpretation of the results. Frequently the student is expected to begin the proceedings with a general exposition of the research findings. There are varying practices with respect to the composition of the university oral examining committees. The committee may consist of the candidate's advisory committee, or it may be a committee named by the department head (typically with the approval of the graduate dean), or it may be appointed by the graduate dean (often with nominations from the department). The chairperson of the examining committee may be the graduate dean, the department head, the dissertation adviser, or a member of the faculty from another department. In some cases only the committee members attend; in some the examination is open to the public.

A minimum number of committee members is usually specified (at least four or five) with the requirement that all be of assistant professor rank or higher and possess the Ph.D. degree or the highest degree in their field of specialization (although the graduate dean may be empowered to make exceptions).

Some institutions require that all members of the examining committee be full time members of the university's faculty. Some may permit, encourage, or even require, the appointment of one or more appropriate members from outside the university, with the approval of the graduate dean. Sometimes such outside members are required to be in addition to the stated minimum number of members. Typically, the final examination is not permitted to be

scheduled until the research adviser has read a draft of the dissertation and notifies the graduate dean that the dissertation is satisfactory and requests that the examination be scheduled. A minimum waiting time is usually specified in order that members of the committee have sufficient time to read the dissertation.

The examining committee is charged with the task of determining, through the reading of the dissertation and by the conduct of the examination, whether (1) the dissertation is satisfactory and (2) the candidate defended it successfully. With respect to the committee's voting, almost all universities require more than a simple majority to pass the candidate. Some specify that a single negative vote fails the candidate, some that two or more negative votes are required to fail. If the candidate does fail the examination, a substantial waiting period (often three to six months) may be required before a reexamination may be scheduled. Typically, not more than one reexamination is permitted.

The Doctorate

The student who has satisfactorily completed all requirements is awarded the Ph.D. degree. The degree is a recognition of the fact that the student has demonstrated mastery of a field and has successfully completed and defended a dissertation, and also that the student has the ability to complete a substantial piece of research work, to present formally the results of this work, and to appreciate its significance in the context of the general field.

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